



AIR MONITORING FACT SHEET



EPA air monitoring equipment in Louisiana

DEQ has prepared this fact sheet to assist the public in understanding the air monitoring and the subsequent results associated with the potential impacts of the BP Deepwater Horizon Oil Spill. While air monitoring is a complex science, we hope that this fact sheet addresses the questions of the general public in terms that are easily understood.

What potential air pollution could be expected from the BP oil spill?

Historical data on oil spills indicate that volatile organic compounds (VOCs) are likely to evaporate, disperse, and/or react quickly after the oil reaches the surface of the water at the offshore site. Hydrogen sulfide (H_2S), while a constituent found in heavy crude oil, does not exist in high concentration in this spill of light, "sweet" crude oil.

Controlled burning of the oil produces sulfur dioxide (SO_2), VOCs, semi-volatile organic compounds (SVOCs), and particulate matter in two ranges (PM_{10} and $PM_{2.5}$). SVOCs are a group of polycyclic aromatic hydrocarbons (PAHs). They are primarily responsible for the existence of "oily" or "tar-like" odors. In addition to incomplete burning, SVOCs could also come from "weathered oil". The "weathered oil" is the oil that has spent time in the ocean and which has eventually reached the shore. PAHs present in the weathered oil evaporate slowly over a period of weeks or months.

What air pollutants have EPA and DEQ been monitoring for?

DEQ's ambient air monitoring network includes the following permanent locations that are within the potential oil spill impact areas. We do not monitor for every pollutant at each site, and the variety of analyses are based upon federal monitoring requirements as well as potential impacts of local sources of air pollution. We have been assessing the data from all of these sites as part of our oil spill response. Each of the pollutants is described in more detail below.

Meraux:	SO_2 , H_2S , TNMOC
Kenner:	Ozone, $PM_{2.5}$, TNMOC
City Park:	Ozone, PM_{10} , $PM_{2.5}$
Chalmette Vista:	PM_{10} , $PM_{2.5}$, H_2S , SO_2 , TNMOC, Air Toxics.
Chalmette High:	Ozone, SO_2 , H_2S , TNMOC, Air Toxics
Madisonville:	Ozone and $PM_{2.5}$
French Settlement:	Ozone, $PM_{2.5}$, TNMOC
Thibodaux:	Ozone, $PM_{2.5}$
Hahnville:	Ozone and Air Toxics

Daily DEQ monitoring data can be accessed at <http://www.deq.louisiana.gov/portal/DIVISIONS/AirQualityAssessment/AmbientAirMonitoringProgram/AirMonitoringData.aspx>

Bottom Line, what have been the impacts on air quality since the oil spill began?

Monitoring data has not shown any exceedances of any state or federal air quality standards since the oil spill began. Monitored data for particulate matter, VOCs, and H_2S continue to reflect values that are less than state or federal standards. Even so, some people may be able to smell several of these chemicals at levels well below those that would cause short-term health problems.



Can you explain a bit about the pollutants DEQ samples for?

Particulate Matter as either PM₁₀ or PM_{2.5}

Particles in the air can cause or aggravate a number of health problems. Particles of concern include both very small, “fine” particles (that can only be seen through an electron microscope) and somewhat larger “coarse” dust particles. Fine particles have been more clearly linked to the most serious health problems. Very small particles with diameters less than 2.5 micrometers are called “fine particles.” They are produced any time fuels such as coal, oil, diesel or wood are burned. Fine particles come from fuel used in everything from power plants to wood stoves and motor vehicles (e.g., cars, trucks, buses and marine engines). These particles are even produced by construction equipment, agricultural burning and forest fires.

Hydrogen sulfide (H₂S)

While hydrogen sulfide is associated with oil and natural gas operations, it can also be produced by marshes and sewage treatment plants. Based upon the type of crude oil being released as a result of this oil spill, the anticipated levels are not expected to be high. This light, sweet crude has much lower levels of H₂S than a heavier type crude oil. Though some people may experience eye or throat irritation or headaches as a result of exposure to H₂S, these types of reactions are not expected with this spill due to the lower H₂S levels. The effects of exposure to H₂S go away when levels diminish or when a person leaves the area. H₂S has only been seen at individual monitors on an infrequent basis following the oil spill, this indicates the H₂S is more likely from a local source near the monitor rather than from the oil spill. For comparative purposes, hydrogen sulfide is produced in the human mouth; concentrations ranging from 1 to 100 ppb have been measured in mouth air.

Sulfur dioxide (SO₂)

Sulfur dioxide is produced by the burning of sulfur-containing fuel. Sulfur dioxide in the air comes mainly from activities such as the burning of coal and oil at power plants or from copper smelting. In nature, sulfur dioxide can be released to the air from volcanic eruptions. SO₂ exposures have been linked to adverse respiratory system effects, and this is why EPA regulates it as one of the criteria pollutants. For comparative purposes, typical outdoor concentrations of sulfur dioxide may range from 0 to 1000 ppb.

Volatile Organic Compounds (VOCs)

If you smell a ‘gas station’ like odor – the odor you might smell while filling up your car or opening a can of oil-based paint or stain– it is most likely from volatile organic compounds, or VOCs. The key toxic VOCs found in most oils are benzene, toluene, ethyl benzene, and xylenes. Benzene is a carcinogen and is very closely monitored by EPA and DEQ. VOCs also are instrumental in the formation of ozone. Most of the weathered oil that arrives on shore is not likely to contain high concentrations of VOCs, as these materials will have evaporated many miles off the coast. Consequently, we have not seen high ozone readings from our monitoring stations.

Total Non-Methane Organic Compounds (TNMOC)

DEQ collects samples of TNMOC in order to make decisions regarding potential exposures to toxic compounds. Note that TNMOC values alone cannot quantify air quality. TNMOC in typical urban air includes more than 100 components of VOCs. Normally, the major components are ethane, butanes, propane and pentanes. Those compounds are not toxics, but they do contribute to the formation of ozone. However, the chance of higher concentrations of toxic compounds such as benzene is greater with high TNMOC levels. As part of our oil spill response, EPA and DEQ are taking canister samples when TNMOC levels are higher than a predetermined threshold and analyzing them for specific air toxics. In addition, daily canister samples are taken at Chalmette Vista and Kenner regardless of TNMOC levels.

What additional monitoring is being conducted due to the oil spill?

EPA and DEQ have increased the monitoring at two of the DEQ sites in response to BP Oil Spill. Monitoring frequency has been increased for air toxics at the Chalmette Vista and Kenner sites. DEQ is responsible for collecting the samples and EPA is responsible for analysis. Samples are analyzed for 69 air toxics compounds including potential key toxic compounds from the oil spill: benzene, ethyl benzene, toluene and xylenes. This information is also displayed on the EPA’s website.

EPA is conducting the following active air monitoring in Louisiana:

1. Fixed stations at Grand Isle and Chalmette conduct real-time monitoring of PM_{10} , and TNMOC; Fixed stations at Venice conduct monitoring of PM_{10} , TNMOC, and H_2S .
2. EPA uses the mobile air monitoring buses equipped with Trace Atmospheric Gas Analyzers, or TAGAs, for instant-result air monitoring. Pollutants monitored are benzene, toluene, and xylenes. EPA is also monitoring for 2-butoxyethanol and 1-(2-butoxy-1-methylethoxy)-2-propanol as they are potential pollutants from the dispersants. These two chemicals were chosen for monitoring because they have the highest potential to get into the air in significant amounts.
3. Fixed stations at Chalmette, Venice and Grand Isle conduct canister sampling for benzene, ethyl benzene, toluene, xylenes and naphthalene. Fixed stations at Chalmette and Venice collect cartridge samples for SVOCs.
4. EPA's Air Quality Index (AQI) tracks levels of fine particulate matter ($PM_{2.5}$) and ozone along the Gulf. These data are available publicly daily at <http://gulfcoast.airnowtech.org/>.

What do the numbers from the monitoring mean?

Because different pollutants have different effects, the standards are also set based upon different exposure and concentration levels. Some pollutants have standards for both long-term and short-term averaging times. The short-term standards are designed to protect against acute, or short-term, health effects, while the long-term standards were established to protect against chronic health effects. When deciding what the results mean, one must take into consideration how long the sample was taken in comparison to the averaging time of the standard. If monitoring results, when properly compared to the standards, show high levels it would indicate the need to put more protective control measures into place.

What is averaging time?

Standards are set for 1-hr, 8-hrs, 24-hrs, or even annually. If a standard is set for 24-hrs and the sample was taken for 1-hr, the two numbers cannot



EPA air sampling summa canister with field duplicate in Louisiana

be compared. To compare samples taken for a shorter period than the averaging time of the standard, many samples must be taken and added together and averaged to determine a value to compare to the standard. For example, DEQ air toxic monitors take 24-hr samples every 6 days and the total 55-60 samples taken over a year are averaged to compare to annual standards.

What are the monitoring results showing so far?

Ozone, SO_2 , H_2 , $PM_{2.5}$, PM_{10} have been in normal ranges in the New Orleans and South Louisiana area for this time of the year. There were some elevated SO_2 readings within the Chalmette area, but it is believed that they are mainly the result of emissions from several local industries. EPA has determined: "air quality levels for ozone and particulates are normal on the Gulf coastline for this time of year." Monitored VOC levels in the coastal areas have also been within normal ranges for this time of year. As noted earlier, VOCs in the oil tend to evaporate before reaching the coast. Likewise, air emissions are not expected to change dramatically as the response efforts continue.

Where can I find monitoring results?

Results from Louisiana's permanent monitoring sites can be found at: <http://www.deq.louisiana.gov/portal/DIVISIONS/AirQualityAssessment/AmbientAirMonitoringProgram/AirMonitoringData.aspx>



Results from EPA's monitoring efforts can be found at: <http://www.epa.gov/bpspill/air.html>

What about worker safety?

While EPA and DEQ are monitoring air to safeguard the general population from exposures to toxic pollutants in the air, a number of other federal agencies are also involved:

NIOSH - The National Institute for Occupational Safety and Health is a part of the U.S. Center for Disease Control. This agency works with government and non-governmental agencies and organizations worldwide to conduct research and surveillance and to develop training materials, educational information, and innovative methods to address respiratory health problems associated with air pollution. Through these efforts CDC helps local and state governments and private agencies to inform the public about the health effects of air pollution and provides people with accurate and useful information about steps they can take to protect their health. NIOSH does not issue regulatory standards for pollutants like EPA does however, they do provide information relative to risks due to potential pollutant exposures.

OSHA - The Occupational Safety and Health Administration is a part of the U.S. Department of Labor. It's role is to ensure safe and healthful working conditions for working men and women by setting and enforcing standards and by providing training, outreach, education and assistance. OSHA regulates the use of personal protective equipment, safe work practices, and recommended pollutant exposure levels for workers.

How is air quality assessed?

The federal government determines ambient air quality standards for six "criteria" pollutants: ozone, oxides of nitrogen and sulfur, particulate matter, lead, and carbon monoxide. In addition, the federal government and some states have identified toxicity values for many other pollutants, including those referred to as "air toxics", and these values are used to set standards and assess air quality. State agencies like the DEQ monitor the air and collect data to determine if standards are being met.

What is an Ambient Air Quality Standard?

An ambient air quality standard sets legal limits on the level that an air pollutant can be present in the outdoor (ambient) air and still be protective of public health. Both the Department of Environmental Quality (DEQ) and the U.S. Environmental Protection Agency (EPA) are authorized to set ambient air quality standards.

What is the AQI (Air Quality Index)?

The AQI is an index for reporting daily air quality. It tells you how clean or polluted your air is, and what associated health effects might be a concern for you. The AQI focuses on health effects you may experience within a few hours or days after breathing polluted air. EPA calculates the AQI for five major air pollutants regulated by the Clean Air Act: ground-level ozone, particle pollution (also known as particulate matter), carbon monoxide, sulfur dioxide, and nitrogen dioxide. For each of these pollutants, EPA has established national air quality standards to protect public health. Ground-level ozone and airborne particles are the two pollutants that pose the greatest threat to human health in this country.

How does the AQI work?

Think of the AQI as a yardstick that runs from 0 to 500. As the AQI value gets higher, the greater the level of air pollution and the greater the health concern. For example, an AQI value of 50 represents good air quality with little potential to affect public health, while an AQI value over 300 represents hazardous air quality. An AQI value of 100 generally corresponds to the national air quality standard for the pollutant, which is the level EPA has set to protect public health. AQI values below 100 are generally thought of as satisfactory. When AQI values are above 100, air quality is considered to be unhealthy; at first for certain sensitive groups of people, then for everyone as AQI values get higher.

What do the different colors in the AQI mean?

EPA has assigned a specific color to each AQI category to make it easier for people to understand quickly whether air pollution is reaching unhealthy levels in their communities. For example, the color orange means that conditions are “unhealthy for sensitive groups,” while red means that conditions may be “unhealthy for everyone,” and so on.

AIR QUALITY INDEX FOR OZONE AND PM2.5				
Category	Value	Ozone 2008 8-HR (ppm)	24-HR PM2.5 (µg/m ³)	Suggested Precautions
Good	0-50	0.000-0.059	0-15	None
Moderate	51-100	0.060-0.075	16-35	Unusually Sensitive People Limit Prolonged Outdoor Exertion
Unhealthy for Sensitive Groups	101-150	0.076-0.095	36-65	Sensitive People & Children Limit Prolonged Outdoor Exertion
Unhealthy	151-200	0.096-0.115	66-150	Everyone Limit Prolonged Outdoor Exertion
Very Unhealthy	201-300	0.116-0.374	151-200	Sensitive People Avoid All Outdoor Exertion; Everyone Else Limit Prolonged Outdoor Exertion
Hazardous	301-500	0.375 & up	201 & up	Everyone, especially children and sensitive people, avoid all outdoor exertion.

What is the general scale by which air pollutants are measured?

Air pollutants can exist in air in the form of gaseous or solid particles. Airborne pollutant concentration limits are usually expressed as parts per million by volume (ppmv) for gases and vapors, and µg/m³ for dusts, aerosols and mists. Concentrations of gaseous particles can be expressed in a variety of ways including, ppb (parts per billion by volume), ppm (parts per million), and micrograms per cubic meter (µg/m³).

- One part per billion (ppb) denotes one part out of 1,000,000,000 parts. This is equivalent to 20 drops of water diluted into the Buras water tower, or about three seconds out of a century.
- One part per million (ppm) denotes one part out of 1,000,000 parts. This is equivalent to half a shot glass in a 30,000 gallon swimming pool, or about thirty seconds out of a year. One ppm is equal to 1,000 ppb.

- One thousand µg/m³ is equal to about ¼ teaspoon of sugar in the water from 400 Olympic-sized pools. The unit ppm or ppb can be converted to µg/m³ for the air toxics existing in gaseous form. However, for non-gaseous pollutants such as dusts, mists or aerosols, it is very difficult, if not impossible, to convert µg/m³ to ppmv.

What are air toxics?

Air toxics, or toxic air pollutants, are those pollutants that are known or suspected to cause cancer or other serious health problems. Health concerns may be associated with both short and long-term exposures to these pollutants. Many air toxics are known to have respiratory, neurological, immune or reproductive effects, particularly for more susceptible sensitive populations, such as the elderly and children. Examples of these pollutants include benzene, xylene, toluene, methanol, and ammonia. The degree to which a toxic air pollutant affects a person’s health depends on many factors, including the route of the exposure, quantity of pollutant, the duration and frequency of exposure, the toxicity of the chemical and a person’s general health.

How do toxic air pollutants differ from the “Criteria Pollutants”?

In general, the difference between the two groups might be expressed in terms of concentration or quantity. Air toxics can cause human health concerns at much lower levels than the criteria pollutants. However, both groups of pollutants can cause adverse health effects and environmental damage and are subject to different sets of federal and state requirements.

Where do toxic air pollutants come from?

Some air toxics are released from natural sources such as volcanic eruptions and forest fires. Others originate from manmade sources, including both mobile sources (e.g., cars, buses, trucks) and stationary sources (e.g., factories, refineries, power plants, and small businesses). In addition, many routine activities around the home, such as using gas-powered lawnmowers and tools, or using volatile paints and cleaning solvents, release toxic pollutants into the air.



Air monitoring site in Kenner, Louisiana

What are the effects of toxic air pollutants?

Short-term exposures can produce effects such as eye irritation, nausea, or difficulty in breathing, and these conditions are normally remedied when the individual moves out of the exposure area. Long term exposures to high levels of some air toxics may result in damage to the respiratory or nervous systems, and cause birth or reproductive effects. Many factors can determine how different toxic air pollutants affect human health, including the quantity to which a person is exposed, the duration and frequency of the exposure, the toxicity of the pollutant, and the person's overall health and level of resistance or susceptibility.

Does Louisiana have any regulatory programs on air toxics?

In 1991, the Louisiana Department of Environmental Quality (DEQ) established regulations and a set of ambient air standards for the toxic air pollutants. The Comprehensive Toxic Air Pollutant Emission Control Program regulates major sources of air toxics. Major sources of air toxics emit or have the potential to emit 10 tons per year of any single toxic air pollutant or 25 tons per year of any combination of the listed toxic air pollutants. Each year, these sources must submit their emissions in accordance with Louisiana's emissions inventory system. Since the initial reporting year, total toxic air pollutant emissions statewide have decreased by over 67%.

Louisiana is one of only a few states nationally to develop its own ambient air standards for air toxics. These state standards are more stringent than those

imposed by EPA. There are two averaging periods specified in these air standards including 8-hour and annual (arithmetic mean) average standards. The standards can be found in LAC 33:III:Chapter 51; Table 51.2. DEQ operates between 12 and 16 ambient air monitoring stations around the state for air toxics at any given time. Special purpose air toxics monitoring efforts may be of limited duration depending on a number of factors, therefore site locations may fluctuate from year to year.

What is the most predominant toxic pollutant for Louisiana?

Benzene is the predominant toxic air pollutant in Louisiana. Benzene is one of a family of chemicals known as volatile organic compounds or VOCs. It is a component of products derived from coal and petroleum and is found in gasoline and other motor fuels. Benzene is used in the manufacture of plastics, detergents, pesticides, and other chemicals. Benzene is also a major component in tobacco smoke. Research has shown that long term exposure to benzene is carcinogenic. Because it is found in so many products, benzene is a very common air pollutant. According to the National Air Toxics Assessment (NATA) study, the majority of benzene pollution in the ambient air comes from on-road mobile sources such as motor fuel exhaust, non-road mobile sources and opens burning of trash or other materials.

Home use of solvents or gasoline, leaking underground storage tanks and automobile emissions are primary sources of community exposure to benzene. Normal ambient air concentration of benzene tend to average less than 1 part per billion statewide but it is not uncommon for benzene concentrations to be higher for brief periods of time.

As a measure to protect public health, the DEQ has established an ambient air standard for benzene of 3.76 parts per billion (ppb) set as a mean annual average. Currently, none of the ambient monitoring conducted in Louisiana has shown any exceedance of the state standard for benzene. Long term air monitoring also shows the ambient air levels of benzene have declined over 50% in the last fifteen years and are continuing to decline.

What does DEQ do to control and reduce toxic air pollutants?

DEQ developed and promulgated its air toxics regulation package, one of the most stringent state air toxics rules in the country. The standards set forth in these rules are in many cases more stringent than the federal regulation. In addition to incorporating maximum achievable control technology (MACT) standards, the state rule establishes emission reporting requirements for all major sources of toxic air pollutants and sets an ambient air standard for each pollutant. The state list of regulated chemicals includes the federal toxic air pollutants and adds others which are of particular concern in Louisiana, such as ammonia and hydrogen sulfide.

The state rule may be found in the Louisiana Administrative Code - LAC 33:III.Chapter 51, and it may be downloaded in Adobe Acrobat format from the Regulations Web Page: <http://www.deq.louisiana.gov/portal/tabid/96/Default.aspx>.

How does DEQ sample for toxic air pollutants?

EPA has designated several approved methods for the sampling and analysis of toxic air pollutants. DEQ uses EPA's most widely used method to collect specially designed canisters and document sampling and analytical procedures for the measurement of the volatile organic compounds (VOCs) listed in the Clean Air Act. This method designated as TO-15, is designed for measuring toxic air pollutants down to a concentration of 0.5 parts per billion (ppb), but DEQ can typically measure concentrations as low as 0.05 ppb.

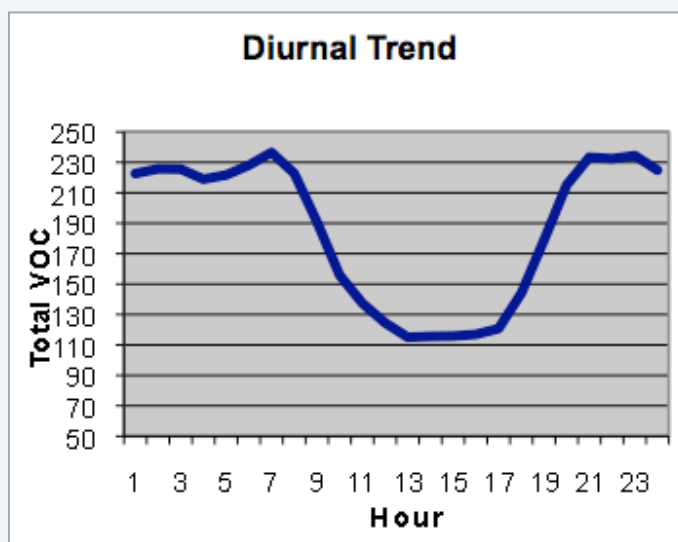
When does DEQ collect air samples?

At most air toxics sampling sites a single sample is collected for a 24-hour period every six days. The samplers generally run from midnight until midnight on the day. DEQ follows the national sampling schedule set by the EPA which can be found at the following link: <http://www.epa.gov/ttn/amtic/calendar.html>

Why are the samples collected for 24 hours?

The purpose of any sampling plan is to collect a sample that is representative of the average conditions.

The ambient air concentrations of most air toxics are known to vary quite a bit during the course of a typical day. The graph below shows the typical daily pattern of VOC concentrations. This is primarily due to changes in the atmospheric conditions that affect how pollutants are dispersed. Additionally, variations in the wind direction will determine which sources impact the sampling location. Sampling schedules running from midnight to midnight insure that a representative sample is collected.



Why are air standards based upon average concentrations?

The concentrations of all air pollutants are known to be highly variable. A single measurement of a pollutant at a given point in time may not be representative of the overall air quality. The concentration of a pollutant is affected by several factors including meteorological conditions, the number of pollutant sources in the area and the distance between those sources and the air monitor, and the amount of naturally occurring background pollution. These factors can cause the concentration of a pollutant at a given location to change quite rapidly over a very short period of time. In order to determine a representative air quality reading, it is necessary to collect many air quality measurements over a specified period of time. These sets of measurements may be averaged together to determine a true representative reading.



EPA air sampling along the Gulf coast

How does DEQ determine if a violation of an ambient air standard has occurred?

From the DEQ monitoring sites, personnel collect samples of air pollutant concentrations. A typical air toxics sampling station operating on the six-day schedule will collect about 55 to 60 samples over the course of a calendar year. These samples are analyzed by the DEQ's contract laboratory, and the data is reviewed and interpreted by personnel in the Air Quality Assessment Division. The data collected are used to track trends in air quality and to determine compliance with both the National and State Ambient Air Quality Standards. Air monitoring results for averaging times specified in the standard are directly compared to the standard to determine compliance. For the compounds that have annual average standards, the mean average concentration for each pollutant is calculated and compared to the standard to determine if the standard has been exceeded. Current monitoring data shows none of the monitoring sites are exceeding any of the air toxics ambient air standards.

Does DEQ wait for a standard to be exceeded before it will investigate a suspected source of toxic pollutants?

No. DEQ will closely monitor any site that has a pollutant average close to the standard. Additionally, if any single twenty-four hour sample contains a concentration of a pollutant that is more than twenty times the annual average standard, DEQ will conduct

an investigation to determine the source of the pollutant and take corrective action before the standard is exceeded for the year.

What about short-term releases of toxic air pollutants?

DEQ also has selected monitoring stations that can collect short duration samples whenever the total volatile organic compound concentrations reach designated threshold levels. These samples are generally collected over 30 to 40 minutes to determine the peak concentrations of the toxic air pollutants. These sample results are combined with meteorological data to help determine the extent to which nearby industrial sources are impacting the monitoring station. These short-term samples are compared to Agency for Toxic Substances and Disease Registry (ATSDR) acute exposure levels and the National Institute for Occupational Safety and Health (NIOSH) short-term exposure levels to determine if any immediate corrective action is needed. Samples collected for a period of less than eight hours cannot be appropriately compared to any of the DEQ eight hour or annual average standards.

What are some other sources of information on toxic air pollutants?

Some of the text used in this fact sheet was taken from EPA's web site. For more information about toxic air pollutants, visit EPA's Air Toxics Web Site at <http://www.epa.gov/ttn/atw/> and at <http://www.epa.gov/air/toxicair/>.

Major industries must also report toxic releases (including releases to air, water, and land) to EPA's Toxic Release Inventory (TRI) under a separate law and environmental program. For more information on TRI, visit EPA's TRI Page at <http://www.epa.gov/tri/>.

Air Quality Index information can be found at <http://www.airnow.gov/>.

For More Information

Call the DEQ Air Quality Assessment Division At 225-219-3488